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A SUPPLEMENTAL SOMARS STUDY TO EVALUATE USER TRANSPARENCY IN A LOGISTICS INFORMATION SYSTEM FOR DEPLOYED UNITS

AIR FORCE INSTITUTE OF TECHNOLOGY,
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

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Wright-Patterson Air Force Base, Ohio

A SUPPLEMENTAL SOMARS STUDY TO EVALUATE USER TRANSPARENCY IN A LOGISTICS INFORMATION SYSTEM FOR DEPLOYED UNITS

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A SUPPLEMENTAL SOMARS STUDY TO EVALUATE USER TRANSPARENCY IN A LOGISTICS INFORMATION SYSTEM FOR DEPLOYED UNITS

A Thesis

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Logistics Management

By

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September 1976

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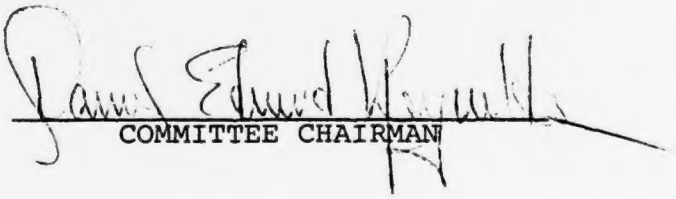

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CHAPTER I

INTRODUCTION

Available unclassified literature indicates that one of the U.S. defense objectives will continue to be flexible response (5; 13; 15).

> Properly prepared modern mobile forces will provide the National Command Authority with the increased flexibility and precision needed for deterring and coping with politico-military crises in all parts of the world. Employment can range from "show of force," through the exercise of small units to the deployment of wing-sized elements with all their equipment. To respond rapidly to world-wide requirements (contingent on beddown base support capabilities), designed USAF offensive, defensive, and support units will be structured, equipped and trained to meet the mobility and deployable standards of the USAF Mobility Plan. . . . Current Air Force doctrine calls for general purpose forces to be organized, manned, equipped, trained and supported to react and fight at all levels of combat in a variety of geographical and air base environments [13:2-4].

Procedures must be developed to provide information systems support when all or a portion of a unit's operation is deployed (3:Para.1,2,3). At present, there are no procedures for meeting automated information system requirements to support mobile units once deployed away from home station. Similarly, there is no procedure to insure the flow of logistics information from the mobile units to home station, MAJCOM, and USAF. All, or a portion, of the logistics information that will be available in-garrison must also be available to deployed units, and

forwarded to appropriate levels so that the management of logistics resources can be accomplished, and the necessary support provided for contingency operations (13:3-7,8).

> If the jobs the computer was doing were not essential to wartime operations, why do them at all? And, if they were essential, who would do them when the force was deployed to react to a threat [15:2-1]?

There is work being done to address the question of the amount and type of automated information system equipment that is theoretically appropriate, and the degree of transparency required to provide system user continuity. The "Support of Mobility Automatic Data Processing Requirements Study (SOMARS)," the "Study of the Support of Air Force Automatic Data Processing Requirements through the 1980s (SADPR-85)," and "Base-Total Operations (BASE-TOP)" all addressed the quantity and characteristics of automated logistics information system equipment for in-garrison and deployed use (3; 9; 10; 11). However, one major problem yet to be resolved is the acceptance, by users of information systems in deployed units, of assertions made by the SOMARS Committee about transparency.

> *Transparency* is a term used for the logistics requirement that a system look the same to the user both in-garrison and when deployed. The user is defined as any person providing input, or receiving output from the system. The logistics requirement for transparency results from the basic need to use the same skills and procedures when deployed as when in-garrison. This is necessary for the continuity required to attain and maintain effective logistics support with no additional training or personnel resources [14:ix,x].

Statement of the Problem

The SOMARS Committee has made a set of assertions (discussed in Chapter II of this thesis) about changes in logistics procedures which would provide an acceptable level of transparency between in-garrison and deployed operations. These assertions are being used as a basis for future development of automated logistics information systems (1; 11). The problem addressed in this research is that of providing an indication of support, or lack of support, by potential system users for the SOMARS Committee assertions.

Justification for Research

The development of logistics information systems, either for the separate functional areas of logistics or for the combined logistics activity, demands that each increment of the system have a mobility capability.

> Transportable automatic data processing/telecommunications capabilities must be available to forces deployed under the "bare-base" concept and must be compatible with the base-level and wholesale logistics systems [3:Para.7-1j].

The logistics information systems developed for base operations will provide the basis for MAJCOM, USAF, and DoD logistics management. When the logistics information system is fully implemented, logistics data from base level, after integration at MAJCOM and USAF, will be included in the Worldwide Military Command and Control System (3:Para.1-4). The Air Force Data Systems Design

Center and Logistics Management Center are actively engaged in developing functional concepts, developing computer software, and evaluating computer hardware to implement incremental phases of proposed logistics information systems. Neither agency has been able to address the mobility issue due to manning constraints and recent organizational and conceptual changes (6; 14:8-24).

According to personnel at the USAF Data System Design Center, before systems design can proceed, they must investigate the question of transparency, since it will have a large impact upon equipment acquisition, training programs, and actual design of both in-garrison and deployed systems for the 1980s. The Design Center has proposed prototype testing and field testing of equipment and software that may meet the criteria for the mobility requirements of the SOMARS Committee. The Design Center has not, however, been able to properly address the question of user acceptability of the SOMARS Committee assertions concerning transparency. Until the questions of equipment and acceptability are answered, the investigation of transparency will remain open (9; 10; 6).

Objective

The objective of this research was to indicate a degree of support for the assertions made by the SOMARS Committee about the procedural changes required in

logistics functions to achieve acceptable levels of transparency. The results of this research can be used as a basis for further system development and subsequent resolution of the overall mobility problem within logistics information systems.

Scope

This research was limited to a synopsis of information concerning U.S. Air Force automated logistics information systems, an analysis of transparency, and a survey of selected individuals to provide an indication of support for proposed system transparency. Students with logistics-oriented backgrounds at the Air Force Institute of Technology, School of Systems and Logistics, were surveyed concerning their assessment based upon their experience with current automated logistics information systems. The survey was summarized, tested, and interpreted to indicate user acceptability of the assertions made by the SOMARS Committee concerning the effect on user transparency of certain procedural changes.

Hypotheses

1. There would be general support for the assertions that each of the following procedural changes would *not* affect user transparency, and would be acceptable for deployed operations:

A. Filling in a Maintenance Data Collection form on a clipboard when deployed, if the form is identical to the information sequence keyed into a computer remote in-garrison, will not affect user transparency.

B. Filling in a hard copy supply inventory during a contingency deployment rather than using hand-held terminals for inventory in-garrison, provided the sequence of entries is the same, will not affect user transparency.

C. Information transfer between maintenance and supply activities by telephone when deployed, rather than through automated systems used in-garrison, will not affect user transparency.

D. Manually recording information for vehicle control, and planning vehicle maintenance activities manually/mentally when deployed, as opposed to computer assisted control and scheduling in-garrison; provided that the quantity of data is not "overwhelming," will not affect user transparency.

2. There would be general support for the assertion that each of the following procedural changes would affect user transparency, and would be unacceptable for deployed operations:

A. Changing from computer record of aircraft configuration status in-garrison to greaseboard status in contingency operations is an unacceptable procedural change.

B. Changing from automated conversion of part numbers to National Stock Numbers when in-garrison to use of cross-reference tables when deployed is an unacceptable procedural change.

C. Changing from automated job scheduling with computer terminal entry in-garrison to manual greaseboard scheduling in contingencies, with equivalent numbers of transactions, is an unacceptable procedural change.

These hypotheses were formulated to provide an indication of support for each of the assertions concerning procedural changes made by the SOMARS Committee (14:Annex A).

CHAPTER II

BACKGROUND

In an environment of automatic data processing improvements and with the emergence of management information systems, the Department of Defense and the three services have made extensive strides in improving management efficiency and effectiveness through the use of automated management information systems (15:2-1; 17:10). Logistic systems management has received particular attention because of the scope and importance of logistics within the Department of Defense.

> Logistics activities collectively manage and/or consume a significant share of Air Force resources. More specifically, base level logistics activities are the largest single user/consumer of manpower, supplies, equipment and facilities with nearly one-fourth of the annual personnel costs and 40 percent of the total operations and maintenance budget being consumed [3:Para.1-1].

At present the functional areas of logistics (Supply, Maintenance, and Transportation) have automated management information systems for their specific activities. These systems are in various stages of development, and are continually being upgraded (3; 6; 15; 17). There have been developmental projects initiated to investigate an integrated management information system for the total logistics activity of a base, the total ADP requirements

for a base and mobile ADP requirements. Similarly, long-range planning for follow-on logistics information systems is in progress (3; 6; 8).

Base-Level Logistics Information Systems

Management information systems for Air Force base-level logistics activities have evolved over time. Computer software and hardware were introduced that filled the distinct requirements of the individual activities. Systems planners have designed the potential for expansion and change into the system to allow for improved computer hardware and possible development of a total information system for logistics (3; 6; 9).

Supply. The current Standard Base Supply System (SBSS) will continue in its basic configuration, and will continue to use the UNIVAC 1050-II computer. Improved computer capacity through the addition of Front-End-Processors (FEP), and replacement of storage drums with disk storage will allow evolutionary improvements that will enhance Base Supply management efficiency and allow integration of the SBSS into a follow-on logistics information system (3:Para.2-1—2-3).

The improved Base Supply information system will provide increased computer on-line time, incorporate a wider range of remote terminal devices, and allow interrogation of the primary supply data base by other logistics

system modules (3:Para.2-2). In the future, the improved SBSS, in conjunction with the other logistics information systems, will be expanded to include Fuels Management, Munitions Management, Equipment Management, and Time Compliance Technical Order Management (8:28).

As with other logistics information systems, "The Operational system must be capable of immediate use under combat conditions [3:Para.2-2a(9)]." This mobility requirement will lead to an end design that will be modular and transportable.

Maintenance. The maintenance function at base level has been using automatic data processing for several years. Most recently, the Maintenance Management Information and Control System (MMICS) has been incrementally implemented. Three elements have been implemented already. They are: aerospace vehicle status reporting, delayed discrepancy files, and documentation automation. Two additional elements, configuration and maintenance events subsystem, and job following subsystem, have been held in abeyance (8:29).

> While Near-Term (FY75-77) maintenance improvements will be primarily dedicated to enhancements and expansion of the MMICS into all maintenance disciplines, the intermediate term (FY78-79) must be dedicated to the systematic investigation, design, and development of new maintenance capabilities, incorporating those capabilities previously identified in MMICS increments 4 and 5 [3:Para.3-13].

The improved MMICS will enhance management and control of maintenance at home or deployed. Improved support for maintenance managers by automated systems is the continuing goal of the Maintenance information system. Hardware acquired will be designed with a mobility capability, and will probably include small stand-alone processors for each of the maintenance functions. The eventual configuration will allow MMICS-SBSS interface to meet the follow-on logistics information system objectives (3:3-5—3-12).

Transportation. Automated management information systems for the base-level transportation function will also be incrementally implemented. The transition from batch processing systems to an on-line system will expand current systems and add new subsystems (8:29-30).

> The future systems concepts have not been fully defined in any area of transportation. It is intended to evolve transportation systems . . . in order to meet not just currently known requirements, but new requirements as they occur [3:Par..4-4].

Near term objectives include conversion of the Automated Vehicle Operator Record System to an on-line system, conversion of the Non-Temporary Storage Goods system for cost comparison of Household Good Tariff, automation of control records for inbound and outbound shipments, upgrade of Vehicle Integrated Management System, and addition of a system to control personal property contractual services.

As currently seen, the transportation information system will eventually be expanded to include personal property management, vehicle operations management, vehicle maintenance management, and air terminal services management. The eventual configuration will allow interface in follow-on logistics information systems (3:Para.4).

Total Information System Development Projects

In conjunction with the ongoing programs to improve existing logistics information systems there have been projects initiated to investigate methods to accomplish the integration of existing systems into a single total information system for logistics (1; 2; 8). Two of these projects, the System to Automate Logistics at Base Level, and the Base Automated System for Total Operation, have had significant impact on policy decisions.

System to Automate Logistics at Base Level (STALOG)

In 1968, the Air Force Vice Chief of Staff directed a study to investigate an automated base level logistics management system. The results of the Vice Chief of Staff's direction was STALOG. The Assistant Secretary of the Air Force for Financial Management gave concept certification to STALOG on 28 February 1974 (8:27).

Basically, it was planned that current logistics information systems would be modified, expanded, and

integrated to provide continuous improvements (8:27-30). STALOG was designed to create a single management information system for logistics activities at base level.

> It [STALOG] is a "total" system in that all functional operations and management are performed within the context of a single interfunctional, interactive data system. This results in enhanced base-level logistics systems efficiency/effectiveness through improved man-machine interaction in a total logistics environment [3:Para.1-4d].

The motivation for development of an integrated logistics information system was that reductions in base logistics manpower must be offset with systems improvement to preserve operational parity (3:Para.1-5). In addition to the total logistics systems concept, STALOG proposed an environment where both workers and managers could be in continual communication with the computer (3:Para.1-4).

In April 1976, the Draft Project Decision was rescinded and concept certification for STALOG was withdrawn (6). At the time of concept certification withdrawal there were 250 incremental STALOG projects (modules) being considered by the Data Systems Design Center. Current (Summer 1976) plans call for transferring approximately 180 of these projects to the Logistics Management Center for additional functional analysis and development of functional concepts. Responsibility for the remaining seventy projects has been retained by the Data Systems Design Center. The projects retained deal with improvements

to existing systems. It is proposed that software development and systems analysis responsibility be retained by the Data Systems Design Center for existing logistics information systems and for projects developed by the Logistics Management Center (6).

Base Automated System for Total Operation (BASE-TOP)

The BASE-TOP Project Plan indicates that there is an increasing need for virtually all of the functions on a base to use ADP in the management of their activities (2:1-6). The logistics functions of an organization will be a major user of ADP capability (4:1).

The BASE-TOP study was implemented to define further base-level ADP requirements and prepare a unified overall design for the combined functional ADP requirements (10:2).

> Under this approach, processes in functional areas such as Logistics, Comptroller, Operations, Programs and Resources, Surgeon General, and Data Automation will be implemented on an incremental basis. This will allow for critical processes to be supported as quickly as possible and still move toward replacement of the UNIVAC 1050-II and Burroughs 3500 systems [10:3].

BASE-TOP proposed a management program for the entire base ADP requirements. Each of the functional areas would manage their specific ADP project, while BASE-TOP would manage the hardware and insure that the project conformed to the objectives of BASE-TOP (10:1).

BASE-TOP concept certification was withdrawn concurrent with STALOG concept certification withdrawal (6).

The Capital Replacement Program

Computer hardware advances to facilitate improved logistics information systems were studied separately from systems development projects through a "Study of the Support of the Air Force Automatic Data Processing Requirements through the 1980's (SADPR-85)[10:1-2]."

> The arrival of low cost general purpose minicomputers and large storage capacity and processing power will increase the capability for automation of data closer to the point of origin . . . manual files, records, and reports will be greatly reduced by use of very low cost information systems operated by multiple users with a central file oriented information bank and many remote entry and display devices [3:Para.1-3b].

Subsequent to cancellation of STALOG and BASE-TOP the Capital Replacement Program has been established to develop plans for computer hardware replacement. A proposal to replace existing UNIVAC 1050-II and Burroughs 3500 computer systems in the FY 1981/82 time frame is currently being staffed. Plans call for translation of existing software to the new computers with concurrent "swapping" of existing information. Software development will continue after the new equipment is in place (6). Plans for the Capital Replacement Program are insufficiently firm to allow definitive description of the hardware, however, a single central processing installation

with a minimum of two processing units is foreseen. These plans are consistent with the results of the SADPR-85 study (6).

Support of Mobility Automatic Data Processing Requirements Study (SOMARS)

Neither STALOG, SADPR-85, nor BASE-TOP fully addressed the question of automatic data processing support for mobile operations. Therefore, on 26 April 1974, the USAF Chief of Staff authorized the study of the unique problems associated with ADP support for mobility requirements (12:1). The SOMARS Committee was formed to investigate the mobility support question, and was charged to analyze and resolve the question so that the SADPR-85 equipment recommendations could be completed, and implementation of STALOG continue (10; 11; 15).

The SOMARS Committee developed, through investigative research, a concept for base level ADP support for mobility operations. Consideration was given to the different weapon systems, force structures, and the projected state of technology during the late 1970s and 1980s (11:2-1-8). The Committee determined the information requirements at deployment sites to include volume and types of data which must be received, stored, manipulated, and retrieved and identified the response time required for each functional application (14:4-1-9). The Committee

analyzed various descriptive deployment scenarios, ranging from a small force operating from a main operating base to a large force operating from a bare base. The SOMARS Committee considered the mobility environment, and economic and technological criteria, while selecting from various alternatives the categories of ADP support best suited to fulfill the mobility requirements (14:1-1—1-11).

The results of the SOMARS Committee will be used by the Logistics Management Center and the Data Systems Design Center to guide functional concept thinking for projects being developed, and will influence the individual functional area information systems currently in existence. Similarly, the Capital Replacement Program will include mobile hardware that is compatible with the new computer hardware (6).

The Mobility Environment

The SOMARS Committee, commenting on the mobility ADP requirements, stated:

> The problem of defining requirements for a mobile ADP capability was bounded at the outset by the basic requirements for the Air Force to be capable of responding to any contingency at any time at any place [13:1-1].

For the purpose of discussion the concept of mobility which is engendered by the preceding statement can be broken into three main areas: Planning, Deployment, and Employment (13:Ch.2).

Planning. The planning portion of mobility is important since the majority of situations calling for deployment and employment of forces allow little time for developing strategy and tactics, or planning logistics support once the "crisis" begins. If well prepared plans exist, plans which have been practiced by the forces involved, the chances of successfully responding to a contingency situation are greatly increased (11; 15; 14; 12).

The consideration of ADP systems required by a unit must be included at all levels of planning to insure proper support to the deployed forces at the proper time and place. Personnel and equipment to be used to support deployed forces need to be identified in advance, and procedures devised to effect the orderly transfer of these people and equipment from the in-garrison to the deployed environment. The procedures should include provisions for continuing support of the forces remaining behind at home station. With proper planning, and periodic exercising of the plans, deployed forces and equipment can be prepared to support contingency situations (13:Ch.2).

Deployment/Employment. Once personnel and equipment begin to depart their home stations, the deployment portion of mobility begins. Deployment is the movement of personnel and equipment from home station to the

contingency locations where they are to be employed (13:2-1). Present USAF concepts allow for two major categories of deployed locations or beddown bases: Main Bases and Austere Bases. A Main Base is defined as:

> A base on which all essential buildings and facilities are erected. Total organizational and intermediate maintenance capabilities may be expanded to support specific weapons systems deployed to the main base. ADP capabilities will be available at the main base to provide identical support found on a fully operational U.S. located peace time Air Force Base [12:2-5].

There are a number of different types of bases lumped under the Austere Base category. They are characterized as having somewhat less in the way of facilities and capabilities than does a Main Base. The most extreme case is a Bare Base which has only a runway, taxiways, and a source of water that can be made potable (13:2-6). All other facilities must be brought in and installed. The Bare Base situation generates the greatest requirement for a mobile ADP capability (13:2-8). The remaining bases in the austere category are distributed between Bare Base and Main Base with respect to the amount and kind of facilities available. As a result, the requirement for mobile ADP equipment can vary greatly depending upon the type of base involved (13:Ch.2). Because of the variable nature of mobile ADP requirements, one means of obtaining flexibility in the use of ADP equipment is to design modularity into ADP systems. This modularity allows incremental

deployment based on the type of beddown base and the particular contingency employment required (13:2-14).

Mobility Phases. Three distinct phases of deployment/employment can be identified as Site Preparation, Initial Aircraft Support, and Follow-On Support. The site preparation phase usually coincides with the deployment portion of mobility. This phase involves getting the beddown base ready to accept personnel, equipment, and aircraft. The required shelters are refurbished and/or built and necessary facilities are installed. The Initial Aircraft Support Phase begins with the deployment and arrival of the aircraft at the beddown base and consists of limited remove-and-replace maintenance capability for components, but no major repair capabilities. Parts are obtained from War Readiness Spares Kits and Mobile Bench Stocks. During the Initial Aircraft Support Phase there is a minimum need for ADP support. However, the longer the period of the employment, the greater the need for mobile ADP capabilities (13:2-7,8). The Follow-On Phase is the "long-haul" effort which is geared to semipermanent operation for a period of one month or longer. Intermediate level aircraft maintenance is initiated and a supply support system is required, as well as most other base support requirements. The need for ADP support is greatest during this Follow-On Phase due to the level of operations and maintenance performed, the numbers of

personnel involved, and the expected duration of the employment (13:Ch.2).

The need for rapid initial response and the need for a smooth transition from a home station environment to a contingency environment at a beddown base are two reasons which make consideration of transparency necessary. The need for transparency in mobile ADP systems is even greater when the added confusion that may be caused by hostile conditions is also considered (13:2-15).

Transparency Assertions

Transparency in ADP systems, formally defined in Chapter I, simply means that the ADP system being used must "look" the same to the user both in-garrison and deployed. "In its truest sense, transparency can be achieved by deploying identical input/output devices and software used by the user in-garrison [14:2-2]."

The conditions inherent in contingency situations requiring mobile operations: rapid deployment response, deploying to unknown areas for unknown lengths of time, and employment in a hostile or potentially hostile environment, are the same conditions that generate the need for transparency in mobile ADP systems (11; 14). The SOMARS Committee realized that, for reasons of practicality, moving an entire in-garrison ADP system to a deployed location was not always feasible. As a result, procedural and equipment changes in the ADP systems used in-garrison

and deployed were evaluated for adequacy and acceptable user transparency (14:2-5).

The SOMARS Committee determined, after investigation, that certain variations in input/output device appearance and procedures could be tolerated without adversely affecting the users' normal duty accomplishment. The Committee asserted that these types of changes would not affect user transparency and were acceptable.

> Examples of these types of changes are:
> a. Using video displays in-garrison identical to hard formats which could be used in the deployed environment. It is within the parameters of deployed personnel quantities and skills to fill in a form on a clipboard with a pen when deployed, if the form is identical to that keyed into a video display in-garrison.
> b. Using hand-held terminals for inventory in-garrison with sequence of entries indentical to the entry sequence of a hard copy inventory form used during a contingency.
> c. Using terminal keyboards between maintenance and supply in-garrison for information transfer that could be accomplished and acknowledged by telephone during a contingency.
> d. Managing the operation and maintenance of a small number of vehicles used to support a limited deployment. It is within the capabilities and experience of most personnel to manually record that information, and manually/mentally plan and control the work activities required to insure vehicle availability and operability essential to mission support
> . . . . . .
> For transparency to be maintained, contingency procedures must permit these features, individually or in combination, to remain small enough so that manual management does not physically overwhelm the number of personnel deployed . . .[14:2-3].

Similarly, the SOMARS Committee asserted that some procedural changes were not acceptable because different methodologies and tasks were involved, or that the

number and skills of personnel deployed were inadequate to maintain practical user transparency.

> Examples of these types of changes which are not acceptable for user transparency are:
> (1) Changing from computer record of aircraft configuration status (780 equipment and AME) in-garrison to greaseboard status in a contingency is unacceptable. The transition from computer support of large volumes of complex detail data to an identical record kept manually cannot be accomplished with the number and skills of deployed personnel.
> (2) Changing of automated correlation of part number to national stock number in-garrison to the user cross-reference tables cannot be accomplished with the number and skills of deployed personnel.
> (3) Changing from automated job scheduling with terminal entry in-garrison to manual greaseboard scheduling in contingencies is not acceptable if the same volume of information must be collected and manipulated with equal speed and results. The transition of an ADP operator in job scheduling with computer assistance, to job scheduling with equal input/output by greaseboard cannot be achieved with the numbers and skills of deployed personnel . . . [14:2-4].

Conclusion

The basic theme for the development of Air Force logistics information systems has been that logistics management can be made more effective and efficient by improving the information systems which support the logistics functions (15:17). Logistics information systems are currently being used in the functional areas of base level Supply, Maintenance, and Transporation (3; 8; 9). The Data Systems Design Center conducts ongoing projects to improve these systems (6).

The STALOG and BASE-TOP projects proposed advanced total information systems that would be capable of

integrating the logistics functional areas through a single data base, and managing the ADP requirements for the complete base. While these two projects provided a considerable body of theory and knowledge, neither has been implemented. In addition to the developmental work that was done on STALOG modules, automated information systems for deployed forces and the mobility requirements for the Air Force have undergone investigative research by the SOMARS Committee (11).

The interrelated roles of logistics data automation and mobility, when applied to daily Air Force operations, has become increasingly important (4; 11; 14). The consideration of mobile force information needs is a continuing requirement for system planning in the development of logistics information system hardware and software (6).

Before the mobility portion of logistics information systems can be satisfactorily resolved, a firm definition of transparency must be developed and accepted by the MAJCOMs. In conjunction with this effort, the appropriate levels of transparency must be determined for the various functional areas within the overall logistics environment. When these tasks are accomplished, the Logistics Management Center and Data Systems Design Center can proceed with systems design to meet mobile ADP requirements for the 1980s.

The current situation, and improvements foreseen, provide opportunities to unify information systems at base level, to improve interfunctional approaches to logistics management, and to provide ongoing management and control improvements in a variety of operational environments.

CHAPTER III

METHODOLOGY

As stated in Chapter I, the objective of this research was to provide an indication of support for each of the assertions made by the SOMARS Committee concerning the effect of procedural changes on ADP system user transparency. This chapter describes the instrument used to collect data, the data source, the data collection plan, and the statistical and criteria tests used in conducting the research.

Instrument

Data collection to support the research was conducted using a survey instrument in questionnaire form. A copy of the questionnaire is attached in Appendix A. Statements of procedural changes in providing data for, and obtaining information from, automated logistics information systems when a unit is deployed from home station were selected for respondent evaluation. The statements on the questionnaire were structured to correspond to the assertions made by the SOMARS Committee.

Part one of the survey instrument requested biographical information from respondents. Respondents were then asked to assess each of the statements based on their

judgment of the abilities of the technicians they have supervised or observed, and to indicate their agreement with each statement. Degree of agreement was measured using a seven-point Likert scale.

Data Source

The population selected for sampling was the USAF officers who were graduate students in the Air Force Institute of Technology, School of Systems and Logistics, Graduate Education Division. Approximately 140 officers were assigned to the school as students at the time of the survey.

This population of students appeared to be appropriate for sampling for this research based on the following characteristics: students assigned to the school represented most Major Commands, the students had widely varied backgrounds, over one-half of the students had more than five years experience in logistics fields; and, upon graduation, the students were to be assigned to a variety of logistics management positions in several MAJCOMs and at several levels. Consequently, the population sampled represented both past and potential users of the ADP systems for logistics management.

Clearly, the sample was chosen on the basis of convenience; and therefore, representativeness to the population of all USAF officers in the logistics career

fields cannot be proven. As a result, inferences and generalizations were not made to a larger population.

Data Collection Plan

A pretest of the survey instrument was accomplished using five faculty members of the School of Systems and Logistics as subjects. In addition to answering the questions, these faculty members were asked to evaluate the instrument in terms of readability, content, and acceptability; and make suggestions for improvement of the questionnaire. The results of the pretest were reviewed, and appropriate changes were made. After the changes were made, the corrected instrument was coordinated with each faculty member that suggested a change. The data from the pretest was not used in the analysis of the research.

Administration of the pretest was carried out in the first week of April 1976. Using the corrected instrument, the questionnaire was distributed to the sample members during the third week of April 1976. The sample members were given the survey instrument via the AFIT/SLG individual student message boxes. Respondents were asked to return the completed survey instruments to the researchers via a central collection point. Survey instruments which were not returned within ten days of initial distribution were not used. These time frames were determined

based upon the close proximity of the sample members to the researchers.

Responses were separated into those with and without logistics experience. Data from the responses was then manually compiled by question and degree of agreement. All data from the questionnaire was treated as ordinal level data.

Statistical and Criteria Tests

After the responses had been separated and the data compiled, the proportion of the sample responding in each of the agreement categories for each question was computed. The first four questions on the questionnaire related to the first four hypothesis statements, where agreement supports the researcher's hypothesis that the procedural changes are acceptable in providing the required degree of user transparency. The last three questions on the questionnaire relate to the second set of hypothesis statements. Disagreement on these questions supports the researcher's hypothesis that the procedural changes are not acceptable in that they do not provide the required user transparency.

For purposes of this research, the following degree of agreement categories were treated as the single general category, "Agreement": Agree Slightly, Agree, Agree Strongly. In the same manner, the following categories were treated as the single general category, "Disagreement":

Disagree Slightly, Disagree, Disagree Stongly. The "Neutral" category was treated separately.

It was assumed that one-third (33.3 percent) of the responses would fall in each of the three general categories by chance. If the data exhibited "by chance" characteristics, an inference of no support for the statement was made.

There appeared to be no precedent for establishing proportions of a sample that would demonstrate a degree of support for a statement; therefore, the researchers arbitrarily selected the following criteria:

1. A proportion of less than 50 percent in the "Agreement" category indicated no support for the statement;

2. A proportion of more than 50 percent but less than 60 percent in the "Agreement" category indicated limited support for a statement;

3. A proportion of more than 60 percent in the "Agreement" category indicated general support for a statement.

If the survey results did not indicate general support for a statement of procedural change hypothesized to be acceptable or unacceptable in providing user transparency, a recommendation to restudy the rationale that led to the assertion would be made. Similarly, if the survey results indicated general support for each of the

procedural changes hypothesized as acceptable or unacceptable it would be recommended that future systems development continue using the same rationale that led to the development of this set of assertions.

Data obtained from the sample is attached as Tables 1 through 4 of Appendix B. Analysis of the data, and the conclusions and recommendations of the researchers are presented in Chapter IV.

CHAPTER IV

ANALYSIS, CONCLUSIONS AND RECOMMENDATIONS

Hypotheses concerning the affect of procedural changes on automated logistics information systems users during deployed operations were formulated by the researchers, and are stated in Chapter I. These hypotheses concern the acceptability of changes in procedures for: maintenance data collection, supply inventory, transfer of information between supply and maintenance activities, scheduling vehicle use and maintenance activities, recording configuration status, conversion of item part numbers to National Stock Numbers, and job scheduling.

To establish meaningful conclusions concerning the hypotheses, the researchers performed an analysis of the data gathered during the research. The analysis, followed by the researchers' conclusions and recommendations for action, is presented in this chapter.

Analysis of Findings

A total of 127 questionnaires were distributed to sample members in April 1976. Of this total, 117 questionnaires were returned within the established time frames, for a return percentage of 92.1 percent. Because

of the high percentage of returns, it was the researchers' opinion that no action to correct response data to reflect nonrespondents as either "Neutral" or "Worst Possible Case" was required.

The proportion of responses falling into each of the general categories of agreement, established in Chapter III, was computed using the following equations:

Disagreement $\frac{X_n}{N}$ n = 1,2,3

Neutral $\frac{X_4}{N}$

Agreement $\frac{X_n}{N}$ n=5,6,7

where:

X_n = Number of respondents indicating *n* degree of agreement

n = 7-point Likert scale index

N = Total responses.

Results of this computation are presented as Table 5 through 8 of Appendix B. An analysis of the individual hypothesis statements, using the computed responses proportions, follows.

Statement 1. Phases 4 and 5 of the Maintenance Management Information and Control System (MMICS) includes provisions that allow aircraft maintenance technicians to enter maintenance data directly into computer remotes without filling in a Maintenance Data Collection Form. The researchers hypothesized that in a deployed environment the aircraft maintenance technician who routinely enters maintenance data into a computer remote terminal at home station is capable of filling in a Maintenance Data Collection Form, with the same accuracy, when deployed. Statement 1 of the questionnaire requested respondents to assess this hypothesis. Data collected during the research indicated general support for the acceptability of this procedural change by sample members. Over 80 percent of those respondents with logistics experience indicated agreement with the questionnaire statement.

Statement 2. Hand-held computer terminals are currently being tested by the Data Systems Design Center. The use of this type terminal to take supply inventory has been approved. The researchers hypothesized that a Base Supply technician who uses a hand-held terminal for inventory at home-station can use an inventory form during deployed operations, and that the procedural change would provide sufficient user transparency. Statement 2 of the questionnaire stated that the change from hand-held terminal to manually filling in an inventory form during

deployments was unacceptable. The researchers' hypothesis, that the procedural change described was acceptable, was thus the reverse of the questionnaire statement. More than 75 percent of the respondents indicated disagreement with the questionnaire statement; therefore, general support for the hypothesis was provided by the sample members.

Statement 3. Plans for future logistics information systems include an automated transfer of information between maintenance and supply activities. The researchers hypothesized that in a deployment environment maintenance/supply information could be transferred, with the same accuracy, by telephone or radio. Statement 3 of the questionnaire called for respondent assessment of this hypothesis. Respondents with logistics experience indicated limited support (58.1 percent agreement) for the acceptability of the procedural change; however, only 46.8 percent of those respondents without logistics experience indicated agreement. Because of the limit support shown, responses from sample members with either aircraft maintenance or supply experience were extracted and analyzed. Over 70 percent of this subset of the sample indicated that the procedural change from automated to manual transfer of information between maintenance and supply was acceptable for deployed operations. The

hypothesis received general support form those respondents who, in the authors' opinion, are the most knowledgeable concerning the interface of supply and maintenance.

Statement 4. Automated data storage and computer assisted scheduling of vehicle use and maintenance activities will be implemented at base level in the near future. The researchers hypothesized that technicians trained to use the automated system at home station could produce an acceptable schedule manually/mentally when deployed. Statement 4 of the questionnaire indicated that the procedural change from automated to manual scheduling was unacceptable, and did not provide sufficient user transparency. Because the questionnaire statement was worded in reverse of the hypothesis, responses in the Disagreement category support the research hypothesis. More than 65 percent of the sample members indicated disagreement with the questionnaire statement; therefore, general support for the hypothesis was provided by sample members.

Statement 5. The MMICS configuration currently in use at most bases allows aircraft configuration status to be kept current through computer entries by controlling technicians. The researchers hypothesized that, because of the large number of entries required and the number of controlling technicians to be deployed, the procedural change from automated configuration status to greaseboard

status with manual entries was unacceptable. Statement 5 of the questionnaire requested respondent evaluation of the statement that the procedural change from computerized configuration status to manual status was acceptable, and provided logistics information system user transparency; the reverse of the hypothesis. Nearly 60 percent of the respondents indicated agreement with the questionnaire statement, while only 27.4 percent of the respondents supported the researchers' hypothesis by indicating disagreement with the questionnaire statement; therefore, no support for the hypothesis was provided by sample members.

Statement 6. Improvements to the Base Supply UNIVAC 1050-II computer system, and new Standard Base Supply System (SBSS) software, will allow requisitioning by item Part Number rather than National Stock Number. In a deployed environment, with its limited computer support, this capability would not be available. The researchers hypothesized that with the number and capability of deployed technicians the procedural change, from requisitioning items by Part Number to using cross-reference tables to obtain a National Stock Number, then requisitioning the item, would be unacceptable. In Statement 6 of the questionnaire, respondents assessed the statement that the use of cross-reference tables to obtain National Stock Numbers when deployed was acceptable. Response in

the Disagreement category would indicate support for the hypothesis that the change was unacceptable. Less than 25 percent of the respondents indicated support for the hypothesis, while 60.7 percent of the sample members indicated their opinion that the use of cross-reference tables in a deployed environment would not affect user transparency, and was therefore an acceptable procedural change.

Statement 7. Traditionally, job scheduling has been done by controlling technicians using manual grease-board scheduling. MMICS Phase 5 will provide computer assisted job scheduling, and eliminate the need for traditional scheduling techniques. The researchers hypothesized that the quality of the scheduling process would be degraded by changing from computer assisted scheduling at home station to manual scheduling when deployed. Statement 7 of the questionnaire called for respondent assessment of the statement that user transparency was adversely affected by the procedural change in the scheduling process. From the research data there was no clear indication of agreement or disagreement with the questionnaire statement. While 45.3 percent of the respondents registered disagreement with the statement, 41.0 percent registered agreement. With this near balance of responses, the data appears to indicate "by chance" characteristics.

Conclusions

Management efficiency and effectiveness have been improved by the use of automated management information systems. Within the Department of Defense, the management of the logistics systems, and the benefits that could be derived by improvements to the logistics information systems, have received particular attention (see Chapter II).

It has been theorized that all, or a portion, of the logistics information that will be available at home station must also be available to deployed units. The amount and type of automated information system equipment that is appropriate for deployed units is being investigated by the Data Systems Design Center and the Logistics Management Center (see Chapter I).

Logistics information system transparency refers to the ability of users to operate different configurations of computer hardware/software with the same procedures or skills, or to the acceptability of procedural changes when computer system configuration or information changes. For deployment operations, the transparency of the logistics information system to be deployed, as compared to the logistics information system used at home station, has been investigated by the SOMARS Committee. As a result of this investigation, the SOMARS Committee made a set of

assertions concerning the acceptability of procedural changes for users of deployed logistics information systems (see Chapter II).

The research was conducted to provide an indication of support for the SOMARS Committee assertions by past and present users of logistics information systems. The researchers' conclusions concerning the assertions follow.

The SOMARS Committee asserted that technicians will perceive no procedural difference in writing logistics data on a form when deployed and entering the data directly into a computer remote terminal at home station. The research data supports the assertion that user transparency will not be affected by these proceudral changes. The researchers conclude that future logistics information system development should continue using these assertions as criteria, and that logistics information systems for deployed units need not include the capability for direct computer input of logistics data.

Concerning the interchange of information between maintenance and supply activities, the SOMARS Committee asserted that the transfer of information between maintenance and supply activities could be satisfactorily accomplished by telephone or radio during deployed operations when the logistics information system used at home station provided automated transfer of the information,

and that technicians would require no additional skills for the procedural change. The SOMARS Committee further asserted that requiring technicians to manually convert part numbers to National Stock Numbers before ordering a part during deployed operations when the logistics information system used at home station allowed ordering parts by part number was not an acceptable procedural change. The research data indicates that logistics information system user transparency would not be affected by either of these procedural changes, and that both changes are acceptable during deployed operations. The researchers conclude that logistics information systems for deployed units need not include either the capability for automated transfer of information between maintenance and supply activities or the capability for automated conversion of part numbers to National Stock Numbers.

In the opinion of the researchers, there is no significant difference in the skills or procedures required to initially find a part number in an Illustrated Parts Breakdown Technical Order, and those needed to convert a part number to a National Stock Number in cross-reference tables. Therefore, logistics information system users should perceive no difference in adding one step to the part ordering procedure during deployed operations.

The SOMARS Committee asserted that vehicle maintenance and use could be manually/mentally scheduled during

deployment operations, provided the quantity of data was not "overwhelming," when computer assisted scheduling was used for these tasks at home stations; but the change from computer assisted job scheduling of aircraft maintenance activities at home station to manual scheduling during deployed operations was an unacceptable procedural change. The research data indicates that logistics information system user transparency would not be affected by either of these procedural changes, and that the change from computer assisted scheduling to manual scheduling is acceptable during deployed operations. The researchers conclude that logistics information systems for deployed units need not include the capability for computer assisted scheduling.

The skills and procedures required for manual scheduling of maintenance activities, and the skills and procedures required for evaluating computer assisted scheduling reports are vastly different. In the opinion of the researchers, supervisory personnel will continue to be required to perform complex scheduling procedures for activities not covered by computer assisted scheduling. The researchers do not question the fact that computer assisted scheduling can produce a schedule more rapidly than manual means, nor that a computer will evaluate situations with consistent, complete logic before selecting the alternative that best meets criteria. However, because

scheduling skills are used regularly by supervisors, those same supervisors should have the skills required to produce an acceptable schedule without computer assistance until the deployed operation reaches the follow-on support phase.

From an evaluation of the research results, the researchers conclude that the ability of the trained military technicians and supervisors to function in changing environments was not considered sufficiently by the SOMARS Committee. The research data indicates that a high degree of logistics information system user transparency is not required during the initial phase of deployment operations. Logistics activities in a deployed environment will differ somewhat from the logistic activities at home station. The researchers believe that personnel can adapt to the changed environment and continue to function well with minimum automated information system support. As the deployment operation grows into the follow-on phase, semiperminent operations are established, and logistics activities become more like those performed at home station. During the follow-on phase computer support becomes more important, and a logistics information system as similar to the system used at home station should be provided.

Recommendations

In it within the technological state-of-the-art to provide completely mobile ADP systems, or to transport home station ADP systems for use in deployed operations. Our research indicates that this degree of ADP support is not required for the logistics information systems for deployed units.

The researchers recommend that agencies involved in developing logistics information systems for deployed operations reconsider the assertions made by the SOMARS Committee before the assertions are made into criteria by which the logistics information system is judged.

APPENDIXES

APPENDIX A

AUTOMATED LOGISTICS SYSTEMS ATTITUDE SURVEY

APPENDIX A

AUTOMATED LOGISTICS SYSTEMS ATTITUDE SURVEY

This questionnaire was developed as part of an AFIT School of Systems and Logistics research effort on Automated Logistics Information Systems. The questionnaire will help to determine how automated logistics information systems can be better designed to meet user needs and desires.

On the following pages, you will find several questions about your attitudes concerning the use of logistics information systems for mobile operations. Please read them carefully. It should take no more than ten minutes to complete the questionnaire.

The questions are designed to obtain *your* perceptions of the abilities of the technicians you have supervised or observed.

There are no "trick" questions. There will be no attempt to identify individual respondents. Please answer each item as honestly and frankly as possible.

Thank you for your cooperation.

PRIVACY STATEMENT

In accordance with paragraph 30, AFR 12-35, the following information is provided as required by the Privacy Act of 1974:

a. Authority:

(1) 10 U.S.C., 80-12, *Secretary of the Air Force, Powers, Duties, Delegation by Compensation;* and/or

(2) EO 93-97, 22 Nov 43, *Numbering System for Federal Accounts Relating to Individual Persons;* and/or

(3) DoD Instruction 1100.13, 17 Apr 68, *Surveys of Department of Defense Personnel;* and/or

b. Principal purposes. The survey is being conducted to collect information to be used in research aimed at illuminating and providing inputs to the solution of problems of interest to the Air Force and/or DoD.

c. Routine Uses. The survey data will be converted to information for use in research of management-related problems. Results of the research based on the data provided, will be included in written master's theses and may also be included in published articles, reports, or tests. Distribution of the results of the research, based on the survey data, whether in written form or presented orally, will be unlimited.

d. Participation in this survey is entirely voluntary.

e. No adverse action of any kind may be taken against any individual who elects not to participate in any or all of this survey.

SECTION ONE

BIOGRAPHICAL INFORMATION

This part of the questionnaire asks you to describe some elements of your past experience in the Logistics fields. The data will be used to group respondents.

Note again the results of these questionnaires will be kept confidential. No attempt to attribute responses will be made.

1. Please enter your years of experience in Logistics Career fields. _____

   Example: 9 years

2. Please enter your last logistics-related AFSC, if any. _____

   Example: 4024

3. Please enter the level of your last assignment. _____

   Example: Squadron, Wing, MAJCOM

4. Have you had experience using on-line automated information systems? (Yes/No) _____

SECTION TWO

SURVEY

This part of the questionnaire asks you to indicate a degree of agreement with several statements concerning the use of an automated logistics information system.

Please read the scenario below before responding. Answer the questions using your judgment as to the abilities of technicians you have supervised or observed, *NOT* as to your judgment of your abilities.

Scenario

Several years ago your unit converted to an automated data processing environment. The technicians have been trained to use the ADP equipment, and both technicians and supervisors have come to rely heavily on computer assistance in the decision-making process.

Suddenly, your unit is deployed to a base where no ADP support is available.

Please turn the page and indicate your responses.

Write a number in the blank for each situation statement, based on this scale:

1. Disagree Strongly	*4. Neutral*	*5. Agree Slightly*
2. Disagree		*6. Agree*
3. Disagree Slightly		*7. Agree Strongly*

___ 1. It is within the capabilities of aircraft maintenance technicians to manually fill in a Maintenance Data Collection form when deployed, if the form is identical to the information sequence keyed into a computer remote in-garrison (at home station).

___ 2. A Base Supply technician who uses a hand-held terminal for inventory in-garrison cannot change his methods sufficiently to allow him to fill in a hard-copy supply inventory form during a contingency deployment, even if the sequence of entries is the same.

___ 3. Information (requisition control number, requisition status, etc.) between supply and maintenance customers can be accurately transferred by telephone or radio when deployed, as opposed to using interface of automated systems used in-garrison.

___ 4. Vehicle operations and maintenance technicians who routinely use computer assisted scheduling and data storage in-garrison cannot revert to manually/mentally scheduling vehicle use and maintenance activities when deployed.

___ 5. If aircraft and/or equipment status is kept current through computer entries in-garrison, controlling technicians can use greaseboard status devices when deployed without degrading the quality of the information.

___ 6. Suppose supply requests can be entered through a computer terminal using Part Numbers in-garrison. It is within the capabilities of technicians to use cross-reference tables to obtain National Stock Numbers before requesting parts when deployed.

___ 7. Changing from computer assisted job scheduling in-garrison to the "traditional" manual greaseboard scheduling will degrade the quality of the scheduling process.

THANK YOU FOR YOUR COOPERATION

Please put the completed questionnaire in the container labeled SLSR 8-76B near the mailboxes.

APPENDIX B

SURVEY RESPONSE DATA

APPENDIX B

SURVEY RESPONSE DATA

Appendix B contains tables which summarize response data obtained from the sample. Tables 1 through 4 contain the data in raw form, tables 5 through 8 contain grouped data and response percentages.

TABLE 1

COMBINED RESPONSES

Statement	Degree of Agreement						
	1	2	3	4	5	6	7
1	1	3	5	16	19	62	10
2	9	62	18	16	8	3	1
3	1	18	15	15	21	38	9
4	13	46	16	24	10	8	0
5	2	9	21	17	19	43	6
6	3	8	14	21	27	39	5
7	9	23	21	16	24	24	0

NOTE: Total respondents 117.

Number with ADP on-line experience 46.

TABLE 2

RESPONDENTS WITH LOGISTICS EXPERIENCE

Statement	Degree of Agreement						
	1	2	3	4	5	6	7
1	0	1	3	7	13	39	7
2	5	38	11	9	6	0	1
3	0	9	11	4	12	26	8
4	6	29	10	14	6	5	0
5	1	7	15	8	11	23	5
6	2	4	9	8	17	26	4
7	6	14	11	8	17	14	0

NOTE: Total respondents 70.

Number with ADP on-line experience 30.

TABLE 3

RESPONDENTS WITHOUT LOGISTICS EXPERIENCE

Statement	Degree of Agreement						
	1	2	3	4	5	6	7
1	1	2	3	9	6	23	3
2	4	24	7	7	2	3	0
3	1	9	4	11	9	12	1
4	7	17	6	10	4	3	0
5	1	2	6	9	8	20	1
6	1	4	5	13	10	13	1
7	3	9	10	8	7	10	0

Note: Total respondents 47.

Number with ADP on-line experience 16.

TABLE 4

SELECTED DATA FROM RESPONDENTS WITH AFSC 40XX, 64XX

Statement	Degree of Agreement						
	1	2	3	4	5	6	7
3	0	5	3	0	2	13	4
6	0	0	5	4	7	8	3

NOTE: Total respondents 27.

Total with ADP on-line experience 14.

TABLE 5

COMBINED RESPONSES

Statement	Agreement Categories						Agreement Category that Supports Hypothesis Statement
	Disagreement		Neutral		Agreement		
1	10	8.5%	16	13.7%	91	77.8%	Agreement
2	89	76.1	16	13.7	12	10.3	Disagreement
3	34	29.1	15	12.8	68	58.1	Agreement
4	75	64.1	24	20.5	18	15.4	Disagreement
5	32	27.4	17	14.5	68	58.1	Disagreement
6	25	21.4	21	17.9	71	60.7	Disagreement
7	53	45.3	16	13.7	48	41.0	Agreement

NOTE: N=117.

TABLE 6

RESPONDENTS WITH LOGISTICS EXPERIENCE

Statement	Agreement Categories						Agreement Category that Supports Hypothesis Statement
	Disagreement		Neutral		Agreement		
1	4	5.7%	7	10.0%	59	84.3%	Agreement
2	54	77.1	9	12.9	7	10.0	Disagreement
3	20	28.6	4	5.7	46	65.7	Agreement
4	45	64.3	14	20.0	11	15.7	Disagreement
5	23	32.9	8	11.4	39	55.7	Disagreement
6	15	21.4	8	11.4	47	67.1	Disagreement
7	31	44.3	8	11.4	31	44.3	Agreement

NOTE: N=70.

TABLE 7

RESPONDENTS WITHOUT LOGISTICS EXPERIENCE

Statement	Agreement Categories						Agreement Category that Supports Hypothesis Statement
	Disagreement		Neutral		Agreement		
1	6	12.8%	9	19.1%	32	68.1%	Agreement
2	35	74.5	7	14.9	5	10.6	Disagreement
3	14	29.8	11	23.4	22	46.8	Agreement
4	30	63.8	10	21.3	7	14.9	Disagreement
5	9	19.1	9	19.1	29	61.7	Disagreement
6	10	21.3	13	27.7	24	51.1	Disagreement
7	22	46.8	8	17.0	17	36.2	Agreement

NOTE: N=47.

TABLE 8

SELECTED DATA FROM RESPONDENTS WITH AFSC 40XX, 64XX

Selected	Agreement Categories						Agreement Category that Supports Hypothesis Statement
	Disagreement		Neutral		Agreement		
3	8	29.6%	0	. . .	19	70.4%	Agreement
6	5	18.5	4	14.8%	18	66.7	Disagreement

NOTE: N=27.

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SELECTED BIBLIOGRAPHY

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